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A SERIES OF LESSONS ON WATER

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During the fall quarter of 1905 the fourth grade in the School of Education began the study of the growth of Chicago from the historical and civic standpoints. On the historical side the approach was made through a study of the early French settlers and explorers of the Northwest. This included the story of LaSalle and his efforts to establish trading-posts and forts near the Great Lakes, and also the development of trading-posts at Kaskaskia, Vincennes, Detroit, and Fort Dearborn.

Fort Dearborn was taken as the real basis of the Chicago of today, and a model of it was actually constructed in class. Its evolution from that of trading-post to fort and to a village was compared with the Chicago of the present time.

On the civic side, the following problems were taken into consideration: the system of streets and bridges; the drainage system; the illuminating plants; the way the city is governed; and the city water system, and it was in this connection that the experiments for purifying water were given.

A study was made of the development of Chicago's great water system from the time it was simply dipped from the lake to the great crib system of the present time. The construction of the crib was studied, and expeditions were made to the pumping-stations. The methods of purifying water at the cribs were noted. The experiments given were to illustrate the means we have at hand for purifying the city supply, and to show whether it does purify it or not.

First there was a general discussion dealing with the general and specific sources of water, the cycle of rain to rain by means of evaporation and rainfall, leading up to the question of why we attempt to purify water, how we do it, and how we can prove it purified.

Then followed experimentation. Three kinds of water were used which could easily show any change: water plus a little sand

or mud was taken as a type of substances in suspension in water; water colored with red ink, and water in which salt was dissolved, as types of substances in solution. One most essential thing is to have every flask absolutely clean before beginning an experiment, or the object of the experiment may be entirely lost.

Among the ways mentioned by the children for purifying water were boiling, filtering, and distilling, and we took these as three typical methods. We first boiled each of the three kinds of water, to see if boiling could purify it. The results were compared with some of the unboiled water; and as no change for the better was noted, the muddy water remaining just as muddy, the colored water just as red, and the salty water saltier than before on account of the evaporation of some of the water leaving the salt, it was concluded that boiling did not purify the water. (In the beginning of the lessons the children were all anxious to say that the object of boiling, filtering, and distilling was to kill the germs, so we took for granted that it did, and we were to see what the boiling, etc., did to the other impurities.)

It was necessary for the children to keep records of their experiments in order to compare results, and this necessitated reading, writing, and spelling. In the written lessons they followed this outline:

- I. Why did we make this experiment?
- II. What did we do?
- III. What happened?

The drawing lessons consisted of drawing the apparatus, and these were used to supplement the written lessons. The spelling lesson consisted of words frequently occurring in the written lessons.

Filtering was the second experiment, and for this the apparatus was set up in the following way:

The funnels contained a layer of filter paper, and these were filled with clean sand, which should be saturated with clear water before the impure water is poured on. Boxes filled with sand, and having an opening to allow the filtered water to run off, could be used to good advantage to illustrate the use in many cities of filter beds for purifying water. When sufficient

amounts had filtered through to show results, they were compared with the original water. It was observed that the salty water remained as salty as before, the colored water had not changed color, but the muddy water had become clear. From former work the children knew that colored and salty water were types of things in solution in water, and muddy water of things in suspension; so they concluded that filtering must take out things in suspension, but not things in solution. The written, drawing, and spelling lessons in connection with this experiment were given in much the same way as with the previous experiment.

The third way mentioned of purifying water was by distilling, and we were to find out if it really did purify the water. The apparatus for this experiment was a little more complicated than that for the others.

The water was allowed to boil some time to get a sufficient amount distilled over to show results. The children noticed the bubbles of steam come from the bottom of the flask to the surface of the water and break into steam; the steam rise and condense in the cold tube and fall as clear drops in the other flask. The distilled water was compared with the undistilled, and it was seen that distilling had taken out all impurities, things in suspension as well as things in solution; and so it was concluded that distilling was the best way to purify water. The written lessons were given the same as before, with the final question: "Which of the three ways is the best to purify water and why?" The drawing and spelling lessons were given as in previous experiments.

Many other little experiments had to be performed also further to convince a child of some statement, or to prove a statement of which he was not sure. For instance, one child did not seem to understand that boiling did not take out impurities; he thought they evaporated as the water evaporated. Therefore a little of each of the three kinds of water was boiled dry, and in one flask only the dry salt remained in the bottom, in another dry sand, and in the third the red coloring-matter of the ink looking like brick dust, showing that the water, but not the impurities, had evaporated in boiling.